CLAIMS

1. A method of encoding integer lists in a computer system, comprising the steps of:

- dividing a range covering integers of an input list into subsets according to a predetermined pattern; and
- producing coding data including, for each subset containing at least one integer of the input list, data representing the position of said subset in the pattern, and data representing the position of each integer of the input list within said subset.

2. A method according to claim 1, wherein the data representing the position of each integer of the input list within a subset consist of a bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to the input list.

3. The method of claim 2, wherein the position of each subset in the pattern is represented by an integer rank which is included in the coding data, in association with the corresponding bitmap segment, if said subset contains at least one integer of the input list.

4. A method according to claim 3, wherein a coding data container comprising records having respective addresses is provided for storing together coding data produced from a plurality of integer lists, wherein each record of the coding data container includes a first field for storing an integer rank related to the pattern, a second field for storing an address value and a third field for storing a bitmap segment, and wherein the encoding of a non-empty input list comprises the steps of:

a/ selecting an available record of the coding data container;

b/ selecting a subset containing at least one integer of the input list to which no record has been allocated;

c/ allocating the selected record to the selected subset;

d/ storing the rank and the bitmap segment of the coding data produced for the selected subset in the first and third fields of the selected record, respectively;

e/ if every subset containing at least one integer of the input list has a record allocated thereto, storing an end value in the second field of the selected record; and

f/ if at least one subset containing at least one integer of the input list has no record allocated thereto, storing the address of an available record of the coding data container in the second field of the selected record, selecting said available record and repeating from step b/.

5. A method according to claim 4, wherein the coding data container has a first file comprising the first and second fields of the records and a second file comprising the third fields of the records, the first and second files being accessible separately.

6. A method according to claim 4, further comprising the step of grouping the records stored in the data container, so that the records allocated to the subsets for any encoded integer list have contiguous addresses.

7. A method according to claim 1, wherein the coding data produced from one integer list are stored in at least one file allocated to said one integer list.

8. A method according to claim 7, wherein the coding data are stored in first and second files having a common addressing, whereby for each subset containing at least one integer of the input list, the data representing the position of said subset in the pattern are stored in the first file and the data representing the position of each integer of the input list within said subset are stored at a corresponding address in the second file.

9. A method according to claim 1, wherein the subsets are consecutive intervals consisting of the same number of integers.

10. A method according to claim 9, wherein said number of integers is a whole power of 2.

11. A method of encoding integer lists in a computer system, comprising n successive coding layers, n being a number at least equal to 1, wherein each coding layer comprises the steps of:

- dividing a range covering integers of an input list of said layer into subsets according to a predetermined pattern;
- producing coding data including, for each subset containing at least one integer of the input list, data representing the position of each integer of the input list within said subset and, at least if said layer is the last coding layer, data representing the position of said subset in the pattern;
- if said layer is not the last coding layer, forming a further integer list representing the position, in the pattern of said layer, of each subset containing at least one integer of the input list, and providing said further integer list as an input list of the next layer.

12. A method according to claim 11, wherein, in the pattern of each layer, the subsets are consecutive intervals consisting of the same number of integers.

13. A method according to claim 12, wherein said number of integers is a whole power of 2 for each layer.

14. A method according to claim 11, wherein the coding data produced for each layer are stored in first and second files having a common addressing, whereby for each subset containing at least one integer of the input list of said layer, the data representing the position of said subset in the pattern are stored in the first file and the data representing the position of each integer of the input list within said subset are stored at a corresponding address in the second file.

15. A method according to claim 11, wherein the coding data produced from one integer list input in the first layer are stored in at least one file allocated to said one integer list.

16. A method according to claim 11, wherein the coding data produced from one integer list input in the first layer are stored as at least one record chain in a data container allocated to a plurality of integer lists.

17. A method according to claim 16, further comprising the step of grouping the records of the data container so that the records of each chain have contiguous addresses.

18. A method according to claim 11, wherein $n \geq 2$ and layer k data containers each having a plurality of records are provided in a computer memory for $1 \leq k \leq n$, each record of a layer k data container being associated with a layer k integer rank representing the position of a subset in the layer k pattern, and wherein each record of a layer k data container associated with a layer k rank representing the position of a subset in the layer k pattern has a first field for containing data for retrieving the position within said subset of any integer of a layer k input list relating to a layer 1 input list, whereby a combination of said layer k rank with any position retrievable from the data contained in said first field determines a layer k–1 rank with which a respective record of the layer k–1 data container is associated if $k > 1$, and an integer of said layer 1 input list if $k = 1$.

19. A method according to claim 18, wherein each record of the layer n data container associated with a layer n rank further has a second field for containing said layer n rank.

20. A method according to claim 18, wherein, for $1 \leq k \leq n$, said data contained in the first field of a record of the layer k data container for retrieving the position of any integer of a layer k input list within a subset comprise a bitmap segment in which each bit is associated with a respective integer of said subset to indicate whether said integer belongs to said layer k input list.

21. A method according to claim 20, wherein, for $1 \leq k \leq n$, each record of the layer k data container associated with a layer k rank further has a second field for containing said layer k rank.

22. A method according to claim 21, wherein each data container comprises at least two files where the first and second fields of the records of said data container are respectively stored, said files being accessible separately.

23. A method according to claim 18, wherein, for $1 \leq k < n$, each record of the layer k data container further has a second field for containing a number representing the position of an integer of a layer k+1 input list within a subset of the layer k+1 pattern,

and wherein, for $1 < k \leq n$, said data contained in the first field of a record of the layer k data container associated with a layer k rank for retrieving the position of any integer of a layer k input list within a subset of the layer k pattern comprise a pointer to at least one record of the layer k–1 data container in which the second field contains a number representing the position of an integer of said layer k input list within said subset of the layer k pattern, whereby said record of the layer k–1 data container is associated with the layer k–1 rank determined by the combination of said layer k rank with the position represented by said number.

24. A method according to claim 23, wherein said data contained in the first field of a record of the layer 1 data container for retrieving the position of any integer of a layer 1 input list within a subset comprise a bitmap segment in which each bit is associated with a respective integer of said subset to indicate whether said integer belongs to said layer 1 input list.

25. A method according to claim 23, wherein each layer k data container for $1 \leq k < n$ comprises at least two files where the first and second fields of the records of said data container are respectively stored, said files being accessible separately.

26. A method according to claim 18, wherein, for $1 \leq k \leq n$, each record of the layer k data container further has a next address field, whereby record chains are defined in the layer k data container by means of the next address fields, and wherein at least some of the layer 1 input lists are respectively

associated with record chains in the layer n data container, whereby the coding data for layer n relating to one of said layer 1 input lists are stored in or retrievable from the record chain associated therewith in the layer n data container.

27. A method according to claim 26, wherein, for $1 \leq k < n$, said layer 1 input lists are respectively associated with record chains in the layer k data container, whereby the coding data relating to one of said layer 1 input lists for layer k are stored in or retrievable from the record chain associated therewith in the layer k data container.

28. A method according to claim 26, wherein, for $1 < k \leq n$, each record of the layer k data container further has a head address field for pointing to an address of a first record of a respective chain in the layer k–1 data container.

29. A method according to claim 26, wherein each layer k data container for $1 \leq k \leq n$ comprises at least two files where the first fields and the next address fields of the records of said data container are respectively stored, said files being accessible separately.

30. A method according to claim 26, further comprising the step of grouping the records of the data container for each coding layer, so that the records of each chain have contiguous addresses.

31. A computerized method of combining a plurality of first integer lists into a second integer list, wherein at least one of the first integer lists is represented by stored coding data provided by a coding scheme comprising n successive coding layers, n being a number at least equal to 1, each layer having a predetermined pattern for dividing a range covering integers of an input list of said layer into subsets, said first integer list being the input list of the first layer, wherein for any layer other than the last layer, an integer list representing the position, in the pattern of said layer, of each subset containing at least one integer of the input list forms the input list for the next layer, wherein the stored coding data representing a first integer list comprise, for each layer and each subset containing at least one integer of the input list, data

representing the position of each integer of the input list within said subset and, at least if said layer is the last layer, data representing the position of said subset in the pattern of said layer, the method comprising the steps of:

- defining a combination of intermediary lists each corresponding to at least one of the first integer lists;
- for k decreasing from n to 1, computing a layer k result list by combining a plurality of layer k intermediary lists in accordance with said combination; and
- producing the second integer list as the layer 1 result list,

and wherein, for any intermediary list corresponding to at least one first integer list represented by stored coding data, the layer n intermediary list is determined from said stored coding data as consisting of the integers of any layer n input list associated with said at least one first integer list in the coding scheme and, if $n > 1$, each layer k intermediary list for $k < n$ is determined from said stored coding data and the layer k+1 result list as consisting of any integer of a layer k input list associated with said at least one first integer list in the coding scheme which belongs to a layer k subset whose position is represented in the layer k+1 result list.

32. A method according to claim 31, wherein, in the pattern of each layer, the subsets are consecutive intervals consisting of the same number of integers.

33. A method according to claim 32, wherein said number of integers is a whole power of 2 for each layer.

34. A method according to claim 31, wherein, in the coding scheme, the coding data representing the position of each integer of an input list within a subset for the coding layer n define a layer n bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to said input list, while the data representing the position of said subset in the layer n pattern comprise a layer n integer rank associated with said layer n bitmap segment, and wherein the layer n intermediary list for an

intermediary list corresponding to at least one first integer list represented by stored coding data is determined in a procedure comprising:

- initializing a layer n bitmap vector with logical zeroes;
- obtaining the layer n ranks and associated bitmap segments from said stored coding data; and
- for each of said layer n ranks, superimposing the layer n bitmap segment associated therewith onto a segment of said layer n bitmap vector having a position determined by said layer n rank, the superimposition being performed according to a bitwise Boolean OR operation,

said layer n intermediary list corresponding to the resulting layer n bitmap vector.

35. A method according to claim 34, wherein $n > 1$ and in the coding scheme, the coding data representing the position of each integer of an input list within a subset for a coding layer $k < n$ define a layer k bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to said input list, while the coding data further comprise a layer k integer rank associated with said layer k bitmap segment to represent the position of said subset in the layer k pattern, and wherein, for $k < n$, the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data is determined in a procedure comprising:

- initializing a layer k bitmap vector with logical zeroes;
- obtaining the layer k ranks from said stored coding data; and
- selecting any obtained layer k rank belonging to the layer k+1 result list and superimposing the associated layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by the selected layer k rank, the superimposition being performed according to a bitwise Boolean OR operation,

said layer k intermediary list corresponding to the resulting layer k bitmap vector.

36. A method according to claim 35, wherein, for $1 \leq k < n$, the layer k ranks and the layer k bitmap segments associated therewith are stored at corresponding addresses in distinct first and second files, and said procedure for determining the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data comprises:

- providing a rank table in a RAM memory, having records associated with the addresses in said first and second files;
- filling the rank table by writing any selected layer k rank into the rank table record associated with the address of the selected layer k rank in said first file; and
- for any record of the filled rank table containing a layer k rank and associated with an address in the second file, reading the associated layer k bitmap segment at said address in the second file and superimposing the read layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by said layer k rank.

37. A method according to claim 34, wherein $n > 1$ and for any coding layer k such that $1 < k \leq n$, a layer k' filtering list is determined for $k \leq k' \leq n$, said layer k' filtering list being the layer k' input list obtained by providing the layer k result list as an input list in layer k of the coding scheme,

wherein, in the coding scheme, the coding data representing the position of each integer of an input list within a subset for a coding layer $k < n$ define a layer k bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to said input list, while a layer k integer rank associated with said layer k bitmap segment represents the position of said subset in the layer k pattern, and wherein, for $k < n$, the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data is determined in a procedure comprising:

/a/ initializing a layer k bitmap vector with logical zeroes;

/b/ selecting the layer n ranks obtained from said stored coding data, and setting $k' = n$;

/c/ for each selected layer k' rank:

/c1/ if the selected layer k' rank represents the position in the layer k' pattern of a subset which includes at least one integer of the layer k' filtering list, obtaining the layer k' bitmap segment with which the selected layer k' rank is associated;

/c2/ for any integer of the layer k' filtering list whose position within said subset is represented in said layer k' bitmap segment, selecting a respective layer k'–1 rank determined from the selected layer k' rank and said position represented in said layer k' bitmap segment;

/c3/ if k' > k+1, executing step /c/ with k' decremented by one unit; and

/c4/ if k'–1 = k, obtaining any layer k bitmap segment with which a selected layer k'–1 rank is associated, and superimposing said layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by said selected layer k'–1 rank, the superimposition being performed according to a bitwise Boolean OR operation,

said layer k intermediary list corresponding to the resulting layer k bitmap vector.

38. A method according to claim 37, wherein, for $1 \leq k < n$, the layer k bitmap segments are stored in at least one layer k file at addresses respectively corresponding to the layer k ranks associated therewith, and said procedure for determining the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data comprises:

- providing a rank table in a RAM memory, having records associated with the addresses in said layer k file;
- filling the rank table by writing any selected layer k rank into the rank table record associated with the address corresponding to the selected layer k rank; and

- for any record of the filled rank table containing a layer k rank and associated with an address in said layer k file, reading the associated layer k bitmap segment at said address and superimposing the read layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by said layer k rank.

39. A method according to claim 31, wherein a coding data container comprising records having respective addresses is provided for each coding layer $k \leq n$, for storing together layer k coding data of a plurality of said first integer lists, and wherein each record of the coding data container for each layer includes a first field for storing a rank related to the pattern of said layer, a second field for storing an address value and a third field for storing a bitmap segment, whereby said address value either points to another record of the data container where further layer k coding data relating to the same first integer list are stored or designates an end of coding data.

40. A method according to claim 39, wherein the records stored in the data container for each coding layer k are so grouped that the records where the layer k coding data of any first integer list are stored have contiguous addresses.

41. A method according to claim 31, wherein the coding data are stored in at least one file allocated to one first integer list.

42. A method according to claim 41, wherein the coding data of each layer are stored in first and second files having a common addressing, whereby for each subset containing at least one integer of the input list of said layer, the data representing the position of said subset in the pattern are stored in the first file and the data representing the position of each integer of the input list within said subset are stored at a corresponding address in the second file.

43. A method according to claim 31, wherein the intermediary lists include at least one preset list, said preset list consisting of one of the first integer lists for which the layer k input lists, according to the coding scheme,

are determined in advance for $1 \leq k \leq n$, said layer k input lists being the respective layer k intermediary lists corresponding to said preset list.

44. A computer program product for encoding integer lists in a computer system, comprising instructions for encoding the integer lists in accordance with n successive coding layers, n being a number at least equal to 1, wherein a range covering integers of input lists of each layer is divided into subsets according to a predetermined pattern, wherein an integer list to be encoded is the input list of the first layer, the computer program product comprising, for each coding layer:

- instructions for producing coding data including, for each subset containing at least one integer of the input list of said layer, data representing the position of each integer of the input list within said subset and, at least if said layer is the last coding layer, data representing the position of said subset in the pattern;
- if said layer is not the last coding layer, instructions for forming a further integer list representing the position, in the pattern of said layer, of each subset containing at least one integer of the input list, and for providing said further integer list as an input list of the next layer.

45. A computer program product according to claim 44, wherein, in the pattern of each layer, the subsets are consecutive intervals consisting of the same number of integers.

46. A computer program product according to claim 45, wherein said number of integers is a whole power of 2 for each layer.

47. A computer program product according to claim 44, further comprising instructions for storing the coding data produced for each layer in first and second files having a common addressing, whereby for each subset containing at least one integer of the input list of said layer, the data representing the position of said subset in the pattern are stored in the first file and the data representing the position of each integer of the input list within said subset are stored at a corresponding address in the second file.

48. A computer program product according to claim 44, further comprising instructions for storing the coding data produced from one integer list input in the first layer in at least one file allocated to said one integer list.

49. A computer program product according to claim 44, further comprising instructions for storing the coding data produced from one integer list input in the first layer as at least one record chain in a data container allocated to a plurality of integer lists.

50. A computer program product according to claim 49, further comprising instructions for grouping the records of the data container so that the records of each chain have contiguous addresses.

51. A computer program product according to claim 44, wherein $n \geq 2$ and layer k data containers each having a plurality of records are provided in a computer memory for $1 \leq k \leq n$, each record of a layer k data container being associated with a layer k integer rank representing the position of a subset in the layer k pattern, and wherein each record of a layer k data container associated with a layer k rank representing the position of a subset in the layer k pattern has a first field for containing data for retrieving the position within said subset of any integer of a layer k input list relating to a layer 1 input list, whereby a combination of said layer k rank with any position retrievable from the data contained in said first field determines a layer k–1 rank with which a respective record of the layer k–1 data container is associated if $k > 1$, and an integer of said layer 1 input list if $k = 1$.

52. A computer program product according to claim 51, wherein each record of the layer n data container associated with a layer n rank further has a second field for containing said layer n rank.

53. A computer program product according to claim 51, wherein, for $1 \leq k \leq n$, said data contained in the first field of a record of the layer k data container for retrieving the position of any integer of a layer k input list within a subset comprise a bitmap segment in which each bit is associated with a

respective integer of said subset to indicate whether said integer belongs to said layer k input list.

54. A computer program product according to claim 53, wherein, for $1 \leq k \leq n$, each record of the layer k data container associated with a layer k rank further has a second field for containing said layer k rank.

55. A computer program product according to claim 54, wherein each data container comprises at least two files where the first and second fields of the records of said data container are respectively stored, said files being accessible separately.

56. A computer program product according to claim 51, wherein, for $1 \leq k < n$, each record of the layer k data container further has a second field for containing a number representing the position of an integer of a layer k+1 input list within a subset of the layer k+1 pattern,

and wherein, for $1 < k \leq n$, said data contained in the first field of a record of the layer k data container associated with a layer k rank for retrieving the position of any integer of a layer k input list within a subset of the layer k pattern comprise a pointer to at least one record of the layer k–1 data container in which the second field contains a number representing the position of an integer of said layer k input list within said subset of the layer k pattern, whereby said record of the layer k–1 data container is associated with the layer k–1 rank determined by the combination of said layer k rank with the position represented by said number.

57. A computer program product according to claim 56, wherein said data contained in the first field of a record of the layer 1 data container for retrieving the position of any integer of a layer 1 input list within a subset comprise a bitmap segment in which each bit is associated with a respective integer of said subset to indicate whether said integer belongs to said layer 1 input list.

58. A computer program product according to claim 56, wherein each layer k data container for $1 \leq k < n$ comprises at least two files where the first

and second fields of the records of said data container are respectively stored, said files being accessible separately.

59. A computer program product according to claim 51, wherein, for $1 \leq k \leq n$, each record of the layer k data container further has a next address field, whereby record chains are defined in the layer k data container by means of the next address fields, and wherein at least some of the layer 1 input lists are respectively associated with record chains in the layer n data container, whereby the coding data for layer n relating to one of said layer 1 input lists are stored in or retrievable from the record chain associated therewith in the layer n data container.

60. A computer program product according to claim 59, wherein, for $1 \leq k < n$, said layer 1 input lists are respectively associated with record chains in the layer k data container, whereby the coding data relating to one of said layer 1 input lists for layer k are stored in or retrievable from the record chain associated therewith in the layer k data container.

61. A computer program product according to claim 59, wherein, for $1 < k \leq n$, each record of the layer k data container further has a head address field for pointing to an address of a first record of a respective chain in the layer k–1 data container.

62. A computer program product according to claim 59, wherein each layer k data container for $1 \leq k \leq n$ comprises at least two files where the first fields and the next address fields of the records of said data container are respectively stored, said files being accessible separately.

63. A computer program product according to claim 59, further comprising instructions for grouping the records of the data container for each coding layer, so that the records of each chain have contiguous addresses.

64. A computer program product for combining a plurality of first integer lists into a second integer list, wherein at least one of the first integer lists is represented by stored coding data provided by a coding scheme comprising n

successive coding layers, n being a number at least equal to 1, each layer having a predetermined pattern for dividing a range covering integers of an input list of said layer into subsets, said first integer list being the input list of the first layer, wherein for any layer other than the last layer, an integer list representing the position, in the pattern of said layer, of each subset containing at least one integer of the input list forms the input list for the next layer, wherein the stored coding data representing a first integer list comprise, for each layer and each subset containing at least one integer of the input list, data representing the position of each integer of the input list within said subset and, at least if said layer is the last layer, data representing the position of said subset in the pattern of said layer, the computer program product comprising:

- instructions for defining a combination of intermediary lists each corresponding to at least one of the first integer lists;
- for k decreasing from n to 1, instructions for computing a layer k result list by combining a plurality of layer k intermediary lists in accordance with said combination; and
- instructions for producing the second integer list as the layer 1 result list,

whereby, for any intermediary list corresponding to at least one first integer list represented by stored coding data, the layer n intermediary list is determined from said stored coding data as consisting of the integers of any layer n input list associated with said at least one first integer list in the coding scheme and, if $n > 1$, each layer k intermediary list for $k < n$ is determined from said stored coding data and the layer k+1 result list as consisting of any integer of a layer k input list associated with said at least one first integer list in the coding scheme which belongs to a layer k subset whose position is represented in the layer k+1 result list.

65. A computer program product according to claim 64, wherein, in the pattern of each layer, the subsets are consecutive intervals consisting of the same number of integers.

66. A computer program product according to claim 65, wherein said number of integers is a whole power of 2 for each layer.

67. A computer program product according to claim 64, wherein, in the coding scheme, the coding data representing the position of each integer of an input list within a subset for the coding layer n define a layer n bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to said input list, while the data representing the position of said subset in the layer n pattern comprise a layer n integer rank associated with said layer n bitmap segment, the computer program product comprising instructions for determining the layer n intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data, said instructions for determining the layer n intermediary list comprising:

- instructions for initializing a layer n bitmap vector with logical zeroes;
- instructions for obtaining the layer n ranks and associated bitmap segments from said stored coding data; and
- for each of said layer n ranks, instructions for superimposing the layer n bitmap segment associated therewith onto a segment of said layer n bitmap vector having a position determined by said layer n rank, the superimposition being performed according to a bitwise Boolean OR operation,

said layer n intermediary list corresponding to the resulting layer n bitmap vector.

68. A computer program product according to claim 67, wherein $n > 1$ and in the coding scheme, the coding data representing the position of each integer of an input list within a subset for a coding layer $k < n$ define a layer k bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to said input list, while the coding data further comprise a layer k integer rank associated with said layer k bitmap segment to represent the position of said subset in the layer k pattern, the computer program product comprising, for $k < n$, instructions for determining the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data, said instructions for determining the layer k intermediary list comprising:

- instructions for initializing a layer k bitmap vector with logical zeroes;
- instructions for obtaining the layer k ranks from said stored coding data; and
- instructions for selecting any obtained layer k rank belonging to the layer k+1 result list and for superimposing the associated layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by the selected layer k rank, the superimposition being performed according to a bitwise Boolean OR operation,

said layer k intermediary list corresponding to the resulting layer k bitmap vector.

69. A computer program product according to claim 68, wherein, for $1 \leq k < n$, the layer k ranks and the layer k bitmap segments associated therewith are stored at corresponding addresses in distinct first and second files, and said instructions for determining the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data comprises:

- instructions for providing a rank table in a RAM memory, having records associated with the addresses in said first and second files;
- instructions for filling the rank table by writing any selected layer k rank into the rank table record associated with the address of the selected layer k rank in said first file; and
- for any record of the filled rank table containing a layer k rank and associated with an address in the second file, instructions for reading the associated layer k bitmap segment at said address in the second file and for superimposing the read layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by said layer k rank.

70. A computer program product according to claim 67, further comprising, for any coding layer k such that $1 < k \leq n$, instructions for determining a layer k' filtering list for $k \leq k' \leq n$, said layer k' filtering list being

the layer k' input list obtained by providing the layer k result list as an input list in layer k of the coding scheme,

wherein, in the coding scheme, the coding data representing the position of each integer of an input list within a subset for a coding layer $k < n$ define a layer k bitmap segment in which each bit is associated with a respective integer of the subset to indicate whether said integer belongs to said input list, while a layer k integer rank associated with said layer k bitmap segment represents the position of said subset in the layer k pattern, the computer program product comprising, for $k < n$, instructions for determining the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data, said instructions for determining the layer k intermediary list comprising:

/a/ instructions for initializing a layer k bitmap vector with logical zeroes;

/b/ instructions for selecting the layer n ranks obtained from said stored coding data, and for setting $k' = n$;

/c/ for each selected layer k' rank:

/c1/ if the selected layer k' rank represents the position in the layer k' pattern of a subset which includes at least one integer of the layer k' filtering list, instructions for obtaining the layer k' bitmap segment with which the selected layer k' rank is associated;

/c2/ for any integer of the layer k' filtering list whose position within said subset is represented in said layer k' bitmap segment, instructions for selecting a respective layer k'–1 rank determined from the selected layer k' rank and said position represented in said layer k' bitmap segment;

/c3/ if $k' > k+1$, instructions for executing the instructions /c/ with k' decremented by one unit; and

/c4/ if $k'-1 = k$, instructions for obtaining any layer k bitmap segment with which a selected layer k'–1 rank is associated, and for superimposing said layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by said selected layer k'–1 rank, the superimposition being performed according to a bitwise Boolean OR operation,

said layer k intermediary list corresponding to the resulting layer k bitmap vector.

71. A computer program product according to claim 70, further comprising, for $1 \leq k < n$, instructions for storing the layer k bitmap segments in at least one layer k file at addresses respectively corresponding to the layer k ranks associated therewith, and said instructions for determining the layer k intermediary list for an intermediary list corresponding to at least one first integer list represented by stored coding data comprises:

- instructions for providing a rank table in a RAM memory, having records associated with the addresses in said layer k file;
- instructions for filling the rank table by writing any selected layer k rank into the rank table record associated with the address corresponding to the selected layer k rank; and
- for any record of the filled rank table containing a layer k rank and associated with an address in said layer k file, instructions for reading the associated layer k bitmap segment at said address and for superimposing the read layer k bitmap segment onto a segment of said layer k bitmap vector having a position determined by said layer k rank.

72. A computer program product according to claim 64, wherein the intermediary lists include at least one preset list, said preset list consisting of one of the first integer lists for which the layer k input lists, according to the coding scheme, are determined in advance for $1 \leq k \leq n$, said layer k input lists being the respective layer k intermediary lists corresponding to said preset list.